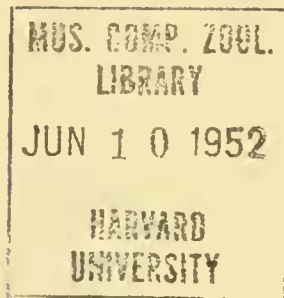


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*BASSARISCUS* IN MIOCENE FAUNAS  
AND "*POTAMOTHERIUM LYCOPOTAMICUM* COPE"

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INTRODUCTION

Cope described a fragment of the lower jaw of a small carnivore from the "Loup Fork of Cottonwood Creek, Oregon," as *Lutricitis ? lycopotamicus* (1879, p. 67). The type has been lost, but was figured (Cope - Matthew, 1915, pl. 119c, figs. 5 and 5a). Matthew (1904, p. 254) corrected the generic reference to *Potamotherium* (as Cope himself also had done at the time the plate was prepared), and noted the loss of the type and absence of other specimens. He considered it a small species and later (1915, *loc. cit.*) suggested that it was related to *Sthenictis*. Also, in 1915, he gave the locality as Pawnee Creek, Colorado, a *lapsus calami*. In 1922 Thorpe referred two specimens in the Yale Peabody Museum collections to this species. Although these are from the Niobrara River fauna of Nebraska, they may well contain the key to the identity of the Oregon form.

Restudy of the specimens described by Thorpe and examination of additional material from the Niobrara River fauna and of fragments from the Crooked River region in Oregon

lead us to the conclusion that they belong to a genus of procyonid carnivores, which is inseparable from the living *Bassariscus* Coues on the basis of lower jaws and teeth alone. A maxillary, described below, which appears referable to the same species, differs markedly from the Recent form, however, and suggests that were more known of these animals, a distinct genus might be indicated. *Potamotherium* Geoffroy, of which *Lutrictis* Pomel is a synonym, is a European otter distinguishable from *Bassariscus* (and from these fossils) by its larger size, stouter jaw, more anteriorly placed single mental foramen, much shorter  $M_2$ , more posteriorly situated metaconid of  $M_1$ , and characters of skull and upper dentition too numerous to mention here.

#### BASSARISCUS PARVUS HALL FROM THE NIOBRARA RIVER FAUNA

Direct comparison of the specimens described by Thorpe (1922, pp. 444-445: Y. P. M., Nos. 12825, 12834) and an additional lower jaw (from locality V3218, U. C. M. P., No. 33147) [see Stirton and McGrew, 1935, p. 127], with *Bassariscus astutus* (Lichtenstein) shows close agreement in such important features as the straight and slender horizontal ramus of the lower jaw; four premolars, the first single rooted; presence of two mental foramina situated beneath  $P_2$  and  $P_3$ ; and the form of the lower carnassial with a high trigonid, including a well developed metaconid, and a basined heel. The form of the premolars in Yale Peabody Museum No. 12825 also agrees with *Bassariscus*. These specimens differ from *B. astutus* and agree with the type of *B. parvus* from Cedar Mountain, Nevada, in the greater crowding of the premolars and relatively shorter trigonid of  $M_1$ . One specimen from locality V3218, University of California Museum of Paleontology No. 29225, shows as much crowding as the type of *B. parvus*. None of the 13 specimens of *B. a. raptor* (Baird) in the Museum of Vertebrate Zoology which were examined show this condition. Niobrara River specimens are below the average

length of *B. astutus*, although within the range of variation of the recent species, as shown by the following tabulation. The length of  $M_1$  in the type of *B. parvus* is less than in any of the recent specimens, although the deviation is not significant.

### Measurements in Millimeters

#### Length of $M_1$

	<i>Number Specimens</i>	<i>Observed Extremes</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Coefficient of Variability</i>
<i>B. astutus</i> (Hall, 1927)	40	6.9-8.0	$7.49 \pm 0.04$	$0.265 \pm 0.030$	$3.54 \pm 0.40$
<i>B. parvus</i> , type			6.8		
<i>B. parvus</i> , Niobrara River	2	7.0-7.3	7.15		

#### Length talonid $M_1$

	<i>Number Specimens</i>	<i>Observed Extremes</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Coefficient of Variability</i>
<i>B. astutus</i> (Hall, 1927)	40	2.4-3.0	$2.70 \pm 0.02$	$0.150 \pm 0.017$	$5.56 \pm 0.62$
<i>B. parvus</i> , type			2.7		
<i>B. parvus</i> , Niobrara River	2	2.4-2.5	2.45		

Errors are standard errors.

A maxillary with  $P^3 - M^2$ , U.C.M.P. No. 31983, from locality V3218, Niobrara River fauna, (fig. 1) occludes so well with U.C.M.P. No. 33147 that it may have come from the same individual. It differs from a series of 13 specimens of *B. astutus raptor* in:  $P^4$  crowded by  $P^3$ ;  $P^4$  with relatively larger parastyle, with smaller protocone, and without hypocone;  $M^1$  with somewhat stronger parastyle;  $M^2$  with parastyle more prominent and hypocone deflected more posteriorly; infraorbital foramen more elongate dorsoventrally. The number and height of cusps and general shape of the teeth otherwise resembles *B. a raptor*. This maxillary bears considerable

resemblance to that of foxes in the absence of a cusp posterior to the protocone of the upper carnassial, in the strong parastyles on  $M^1$  and  $P^4$ , and in the vertical enlargement of the infraorbital foramen. It differs from that of the kit fox, *Vulpes macrotis arsipus* (Elliot) (4 specimens from Yuma Co., Arizona, in M.V.Z.) in: more crowded  $P^3$ - $P^4$ ; shorter carnassial shear; more prominent parastyle and less developed hypocone of  $M^1$ , the latter cusp not so deflected posteriorly; protoconule and metaconule less developed on  $M^1$ ;  $M^2$  proportionately shorter and with less developed cingula and hypocone.

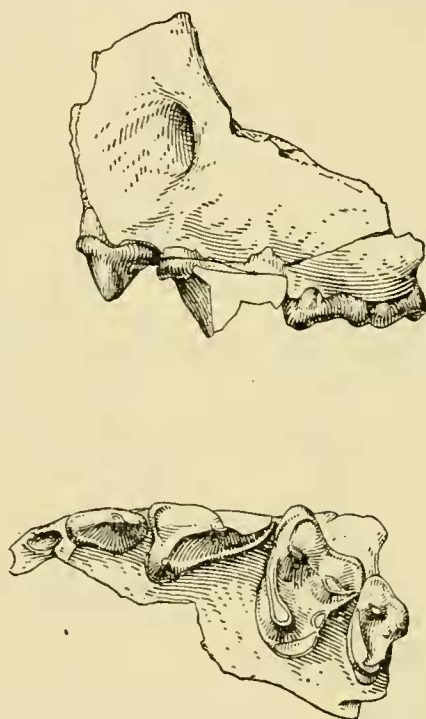


Figure 1. *Bassariscus parvus* Hall. Left maxillary, U.C.M.P. No. 31983, x2. Drawing by Owen J. Poe.

As McGrew pointed out (1938, pp. 326-327) the principal distinctions between *Bassariscus* and the primitive fox, *Pseudocynodictis*, lie in the presence of a posterointernal cusp and more anterior protocone on the upper carnassial, relatively larger metaconule of  $M^1$ , and greatly reduced cingula and absence of hypocone on  $M^2$  in the former genus. The specimen

here described resembles *Pseudocynodictis gregarius* (Cope) in the absence of a posterointernal cusp on P<sup>4</sup>, large parastyle of M<sup>1</sup>, narrow anteroposterior diameter across the protocone of M<sup>1</sup>, somewhat vertical infraorbital canal, and nearly similar size; it differs in the relatively lesser width across the protocone of P<sup>4</sup>, weaker hypocone of M<sup>1</sup>, and undeveloped inner cingulum (smaller hypocone) of M<sup>2</sup>. *Nothocyon lemur* (Cope) differs more markedly in having a still more prominent metaconule and larger hypocone on M<sup>1</sup> (thus approaching *Procyon*) and greater anteroposterior length of the inner part of M<sup>2</sup>.

If correctly associated with the *Bassariscus*-like jaws, this specimen reveals that the late Miocene *B. parvus* retained a primitive, essentially canid pattern in the upper dentition although the lower jaws are scarcely distinguishable from the recent *B. astutus*. Two other procyonid genera, *Cynarctus* and *Cynarctoides*, (McGrew, 1938) lack the postero-internal cusp of the upper carnassial, but these have progressed much farther from the primitive condition typified by *Pseudocynodictis* in their molar pattern. Confirmation of the association of these specimens would probably justify erection of a new subgenus for *Bassariscus parvus* and related forms in which the upper carnassial lacks a fourth cusp, but material here described does not warrant proposal of a new name. The distinctness of *B. parvus* from *B. astutus*, not demonstrable on features of the lower jaw alone, is supported by the tentative association of this maxillary dentition with its unique character combination.

#### ? BASSARISCUS LYCOPOTAMICUS (COPE) FROM OREGON

As figured by Cope the type jaw was slender and straight like that of *Bassariscus*, and contained four premolars in life. Cope described the trigonid of the carnassial as low, and the illustration shows it worn down almost to the level of the talonid. It is difficult, especially in the absence of the type specimen, to judge whether this wear could have been pro-

duced on a *Bassariscus* tooth with its tall trigonid, or whether the tooth was originally lower crowned as in *Sthenictis*. The type of *Bassariscus antiquus matthewi* (Merriam), U.C.M.P., No. 12539, is a heavily worn specimen and the trigonid and talonid of  $M_1$  are worn to nearly the same level. Although  $P_4$  of this specimen is broken at the crown it still shows less wear than  $M_1$ . A similar difference in relative wear is apparent in the figure of *Potamotherium? lycopotamicum*, so it seems possible that the type of that species could have been a *Bassariscus*. Unfortunately the number of molars behind the carnassial cannot be determined as the specimen is broken off directly behind  $M_1$ .

A specimen from Paulina Creek, Oregon, in the collection of Yale Peabody Museum, No. 14313, bears much resemblance to *Bassariscus*. Its ramus is straight and slender but broken off in front of the greatly defaced  $M_1$ .  $M_2$  is absent. The talonid of  $M_1$  is preserved and has a basin with distinct entoconid and hypoconid. Although somewhat smaller than the *B. parvus* specimens from Nebraska there is little in this fragmentary material to distinguish it from them. Paulina Creek is in the Crooked River region and could be either a Mascall (Miocene) or Rattlesnake (Pliocene) locality. The locality data given by Cope for *P. ? lycopotamicum* likewise is inadequate to identify the source formation. No other specimens have been found to verify the location and even in 1907 Merriam and Sinclair (p. 195) pointed out that mixture of material from the Mascall and Rattlesnake formations is easily possible.

It thus seems that "*Potamotherium*" ? *lycopotamicum* is probably referable to *Bassariscus*, and may have come from either Miocene or Pliocene. The limited material available is insufficient to demonstrate its affinities with other species.

#### OTHER MIOCENE OCCURRENCES OF BASSARISCUS

Fossil cacomistle remains have been found in the Lower Snake Creek fauna (*B. antiquus* Matthew and Cook), the

Virgin Valley fauna (*B. antiquus matthewi* Merriam), and Cedar Mountain fauna (*B. parvus* [Merriam] Hall). *B. antiquus* was distinguished from the Recent *B. astutus* by its larger paraconids on  $M_1$  and  $M_2$ , and by the slightly wider heel of  $M_2$ . Merriam (1911, p. 246) sought to establish a new genus, *Probassariscus*, on these characters, but Hall (1927, p. 438) has pointed out that the variability within the Recent genus is such that the fossils should not be accorded more than subgeneric distinction. *B. antiquus matthewi* was not satisfactorily distinguished from the Snake Creek species, and Hall (*loc. cit.*), although recognizing the possibility that better material might reveal differences, maintains that the fossils can not even be shown to be subspecifically distinct. *B. parvus* Hall (*B. nevadensis* Merriam, 1916, non G. S. Miller, 1913) was considered by Merriam to be nearly indistinguishable from the Recent "miners cat" of California, and Hall based most of his distinctions from *Bassariscus astutus* on the crowding of the premolars and size of trigonid of  $M_1$ . The material here described suggests that the species may be valid.

At present then, the following extinct species of *Bassariscus* can be recognized:

*B. antiquus* Matthew and Cook, Lower Snake Creek,  
Virgin Valley

*B. parvus* Hall, Cedar Mountain, Niobrara River

? *B. lycopotamicus* (Cope), Mascall or Rattlesnake

All are founded upon lower dentitions and differ only in minute characters from the living *Bassariscus astutus* (Lichtenstein). The lower teeth of this genus have undergone extremely little change since Oligocene time. The upper molars also are conservative, the principal distinction from *Pseudocynodictis* being a reduction of  $M^2$ , but the upper carnassial has become

modified in the Recent genus through addition of a postero-internal cusp and greater development of the internal cingulum on P<sup>4</sup>. A specimen from the late Miocene Niobrara River fauna suggests that this feature had not been acquired at that time.

#### OTHER AMERICAN SPECIES REFERRED TO POTAMOTHERIUM

*Potamotherium* still appears in some faunal lists of North America\* so it seems advisable to point out that those American fossils which have been identified with this European otter are not at all related to it. *Brachypsalis pachycephalus* Cope was referred to *Potamotherium* by Hay (1902, p. 768); it is a far larger and stouter animal than *P. valetoni* (the genotypic species) and the type of a now well-known American genus of Mustelinae (not Lutrinae). *Potamotherium lacota* Matthew from the Pliocene of South Dakota is likewise larger and referable to *Brachypsalis*; it appears close to *B. modicus* Matthew. As shown above, *Potamotherium ? lycopotamicum* Cope is probably not a mustelid at all but *Bassariscus*.

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\* Not, however, in Simpson's Classification of Mammals.



Measurements in Millimeters

Lower jaws

	<i>B. parvus</i> Hall		<i>B. lycopotamicus</i> (Cope)		<i>B. antiquus</i>
	Niobrara River fauna	Type, Cedar Mountain	Type	Paulina Creek	
	U.C.M.P. No. 33147	Y.P.M. No. 12825	U.C.M.P. No. 19768	Y.P.M. No. 14313	U.C.M.P. No. 12539
P <sub>2</sub> greatest length ...	...	3.4	...	...	...
P <sub>2</sub> greatest width ...	...	1.5	...	...	...
P <sub>3</sub> greatest length ...	4.1	3.8	3.3	...	...
P <sub>3</sub> greatest width ...	2.1	1.8	2.1	...	...
P <sub>4</sub> greatest length ...	4.7	4.2	4.6	...	5.1
P <sub>4</sub> greatest width ...	2.5	2.1	2.3	...	...
M <sub>1</sub> greatest length ..	7.0	...	6.8	6.3	7.0
width at trigonid ..	3.7	...	3.3	...	3.6
width at talonid ..	3.3	...	3.3	...	3.7
approx. length talonid .....	2.5	2.4	...	2.4	2.6
Depth of ramus at P <sub>3</sub>	7.5	6.0	...	...	...
Depth of ramus at P <sub>4</sub>	8.1	7.5	...	...	7.9
Depth of ramus at M <sub>1</sub>	8.1	...	...	...	...
Depth of ramus at M <sub>2</sub>	7.5	...	...	6.5	...
Thickness ramus at M <sub>1</sub>	4.3	3.1	...	3.4	...

## Measurements in Millimeters

U.C.M.P. No. 31983, upper dentition

	<i>Greatest anteroposterior diameter</i>	<i>Transverse diameter</i>	<i>Anteroposterior diam. across protocone</i>
P <sup>2</sup> .....	4.2	2.1	...
P <sup>4</sup> .....	6.5	4.0	...
M <sup>1</sup> .....	5.2	7.3	3.7
M <sup>2</sup> .....	3.2	4.9	2.2

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